Decision Rationale

Total Maximum Daily Load for the Aquatic Life Use Impairment on The Upper North Fork Holston River, Southwest Virginia

I. Introduction

The Clean Water Act (CWA) requires a Total Maximum Daily Load (TMDL) be developed for those water bodies identified as impaired by a state where technology-based and other controls will not provide for attainment of water quality standards. A TMDL is a determination of the amount of a pollutant from point, nonpoint, and natural background sources, including a margin of safety (MOS), that may be discharged to a water quality-limited water body.

This document will set forth the U. S. Environmental Protection Agency's (EPA) rationale for approving the TMDL for the aquatic life use impairment on the Upper North Fork Holston River. EPA's rationale is based on the determination that the TMDL meets the following eight regulatory conditions pursuant to 40 CFR §130.

1) The TMDL is designed to implement applicable water quality standards.
2) The TMDL includes a total allowable load as well as individual waste load allocations (WLAs) and load allocations (LAs).
3) The TMDL considers the impacts of background pollutant contributions.
4) The TMDL considers critical environmental conditions.
5) The TMDL considers seasonal environmental variations.
6) The TMDL includes a MOS.
7) There is reasonable assurance that the TMDL can be met.
8) The TMDL has been subject to public participation.

II. Background

The Upper North Fork Holston River Watershed is located in Bland, Scott, Smyth, Tazewell and Washington counties in southwestern Virginia. The Upper North Fork Holston River is a tributary to the Holston River in the Tennessee/Big Sandy Basin. The benthic impairment on this stream extends 6.94 miles from its confluence with Robertson Branch to its confluence with Tumbling Creek. The watershed is rural with forested and agricultural lands making up 74 and 24 percent of the watershed area respectively.

In response to Section 303(d) of the CWA, the Virginia Department of Environmental Quality (VADEQ) listed the Upper North Fork Holston River (VAS-O11R) on Virginia's 1996 Section 303(d) list as being unable to attain the general standard due to an aquatic life use impairment identified through benthic assessments. The stream has remained on the state's

subsequent impaired waters lists. The stream was also listed for mercury in 2002 and polychlorinated biphenyls (PCBs) in 2004. Both of the new listings were associated with fish consumption advisories.

To assess the biological integrity of a stream, Virginia uses EPA's Rapid Bioassessment Protocol II (RBPII) to determine status of a stream's benthic macroinvertebrate community.[1] This approach evaluates the benthic macroinvertebrate community between a monitoring site and its reference station. Measurements of the benthic community, called metrics, are used to identify differences between monitored and reference stations.[2] The state is currently in the process of changing this methodology to a stream condition index (SCI) approach.

As part of the RBPII approach, reference stations are established on streams which are minimally impacted by humans and have a healthy benthic community. These reference stations represent the desired community for the monitored sites. Monitored sites are evaluated as non-impaired, slightly impaired, moderately impaired, or severely impaired based on a comparison of the biological community of the reference and monitored sites. Streams that are classified as moderately (after a confirmatory assessment) or severely impaired after an RBPII evaluation are classified as impaired and are placed on the Section 303(d) list of impaired waters. The Upper North Fork Holston River has had four VADEQ benthic assessments conducted prior to 2004. A moderate impairment was identified in all four of these samples. The SCI assessment method provides very similar results.

The RBPII analysis assesses the health of the macroinvertebrate community of a stream. The analysis will inform the biologist if the stream's benthic community is impaired. However, it will not inform the biologist as to what is necessarily causing the degradation of the benthic community. Additional analysis may be required to determine the pollutants which are causing the impairment as information can be gleaned based on the composition of the community and the condition of the habitat. TMDL development requires the identification of impairment causes and the establishment of numeric endpoints that will allow for the attainment of designated uses and water quality criteria.[3]

In order to develop a TMDL, the pollutant(s) (stressor(s)) that is impacting the benthic community must be identified and controlled. A stressor identification study was conducted in conjunction with the TMDL. The stressor identification analysis looks at ambient water quality data, habitat assessment data, benthic assessment data, discharge monitoring reports and toxicity data to determine what is impacting the system. The results of the stressor identification analysis

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[1]Tetra Tech 2002. Total Maximum Daily Load (TMDL) Development for Blacks Run and Cooks Creek. Fairfax, Virginia.

[2]Ibid 1

[3]Ibid 1

found chlorides as the pollutant impacting the stream and therefore the TMDL was developed to control this pollutant. The TMDL did not rule out either mercury or PCBs as stressors since they were detected in fish tissue concentrations. However, additional studies are currently being conducted to determine the impacts these pollutants are having on the stream.

The aquatic life use TMDL was developed using the Hydrologic Simulation Program Fortran (HSPF) model. The HSPF model was used to model the loading of chlorides to the impacted stream. The hydrology model was calibrated and validated to observed flow data from a local United States Geological Survey (USGS) gage. The water quality model was calibrated and validated to observed data collected by VADEQ. The HSPF model is a dynamic model that can simulate both watershed loading and receiving water quality over a wide range of conditions. The TMDL used the chronic threshold concentration for chloride as the TMDL endpoint which will allow for the attainment of criteria on the Upper North Fork Holston River. Table 1 identifies the TMDL loadings, the daily load was derived by dividing the annual load by 365.

Table 1 - Summarizes the Specific Elements of the TMDL.

Stream	Pollutant	TMDL	WLA	LA	MOS
Upper North Fork Holston River	Chlorides (kg/yr)	11,263,691	706,752	10,556,939	Implicit
	Chlorides (kg/d)	30,859	1,936	28,923	Implicit

The United States Fish and Wildlife Service have been provided with a copy of the TMDL.

III. Discussion of Regulatory Conditions

EPA finds that Virginia has provided sufficient information to meet all of the eight basic requirements for establishing the aquatic life (benthic) use impairment TMDL for the Upper North Fork Holston River. EPA is therefore approving the TMDL. EPA's approval is outlined according to the regulatory requirements listed below.

1) The TMDL is designed to meet the applicable water quality standards.

As stated above, the biological assessments on the Upper North Fork Holston River were not able to discern a clear stressor to the river. The TMDL modelers therefore conducted a stressor identification analysis to determine what was impacting the benthic community. Current ambient water quality data was able to rule out dissolved oxygen (DO), temperature and nutrients as possible stressors to the Upper North Fork Holston River.

Pollutants were determined to be stressors based on the concentration detected in stream against the state's numeric criteria. Those pollutants for which a criterion did not exist were compared to the probable effects concentration or the 90th percentile of southwestern Virginia reference stations. This 90th percentile of water quality data collected from these unimpaired watersheds was used to determine if a pollutant was a stressor. Pollutants that were consistently

above the 90th percentile were viewed as possible or probable stressors. Although sediment associated problems were noted in the habitat assessment, sedimentation was not viewed as a possible stressor since upstream non-impaired stations had similar sediment scores. Other than mercury and an occasional lead exceedance metals were not found in concentrations in either the water column or sediment that would impact the benthic community. Organics were ruled out as a stressor based on the benthic community hosting some individuals that are intolerant of organics. Chloride was found to be the pollutant impacting the benthic community. Chlorides were found above both the acute and chronic threshold concentrations. Therefore, they were seen as the most probable stressor. The TMDL neither confirmed nor ruled out the impacts that PCBs and mercury are having on the benthic community. The TMDL stated that these pollutants are being further evaluated and a verdict had not been determined.

To model the chloride loading, the HSPF model was used. The HSPF model was calibrated to flow data collected from USGS gage 03488000 from 1995 through 2000. The model was validated to flow data collected from the same gage from 1991 through 1995. Chloride concentrations were highest at the benthic monitoring station during average and lower flow conditions. The water quality model was calibrated to observed water quality data collected from 1990 through 1995 and validated against data collected from 1995 through 2000. The endpoint for chlorides in the Upper North Fork Holston River was 230 mg/l which is the chronic water quality criterion for chlorides. It is believed that concentrations below this would not pose a threat to the benthic community.

2) *The TMDL includes a total allowable load as well as individual waste load allocations and load allocations.*

Total Allowable Loads

Virginia indicates that the total allowable loading is the sum of the loads allocated to land based precipitation driven nonpoint source areas (forest and agricultural land segments) and point sources. Activities that increase the levels of bacteria and sediment to the land surface or their availability to runoff are considered flux sources. The actual value for total loading can be found in Table 1 of this document. The total allowable load is calculated on an annual basis.

Waste Load Allocations

There are six National Pollutant Discharge Elimination System (NPDES) permitted facilities identified as discharging sediment to the Upper North Fork Holston River. Four of these facilities discharge chlorides to the stream, and therefore, need to have WLAs. There were two single family home units, the Saltville Gas and Storage Facility and the Saltville Waste Water Treatment Plant (WWTP). The Saltville WWTP and the two single family treatment units were given a WLA that corresponded to an effluent concentration of 230 mg/l. The Saltville Gas and Storage Facility was provided with a WLA of 376 mg/l which permitting analysis determined was protective of the chronic criterion on McHenry Creek the receiving tributary. A National Priorities List site, Olin Superfund Site, is also permitted to discharge to the Upper

North Fork Holston River. This facility discharges at a rate of 0.1 percent river flow during flows below 160 cfs. This sources WLA was seen as being protective of water quality. Table 2 documents the WLAs and permits.

EPA regulations require that an approvable TMDL include individual WLAs for each point source. According to 40 CFR 122.44(d)(1)(vii)(B), "Effluent limits developed to protect a narrative water quality criterion, a numeric water quality criterion, or both, are consistent with assumptions and requirements of any available WLA for the discharge prepared by the state and approved by EPA pursuant to 40 CFR 130.7." Furthermore, EPA has authority to object to the issuance of any NPDES permit that is inconsistent with the WLAs established for that point source.

Table 2 – WLAs for the Upper North Fork Holston River

Source	Pollutant	Load (kg/yr)	Load (kg/d)
Single Family Unit (VAG400080)	Chlorides	318	0.871
Single Family Unit (VAG400145)	Chlorides	318	0.871
Olin Superfund Site (VAD003127578)	Chlorides	248,491	681
Saltville WWTP (VA0026808)	Chlorides	158,892	435
Saltville Gas and Storage (VA0090115)	Chlorides	298,733	818

Load Allocations

According to Federal regulations at 40 CFR 130.2(g), LAs are best estimates of the loading, which may range from reasonably accurate estimates to gross allotments, depending on the availability of data and appropriate techniques for predicting loading. Wherever possible, natural and nonpoint source loads should be distinguished.

In order to accurately simulate landscape processes and nonpoint source loadings of chlorides, VADEQ used the HSPF model to represent the impaired watersheds. The HSPF model is a comprehensive modeling system for the simulation of watershed hydrology, point and nonpoint source loadings, and receiving water quality. HSPF uses precipitation data for continuous and storm event simulation to determine total loading to the impaired segments from the various land uses within the watershed. The TMDL called for the removal of all straight pipes and non-operating point sources and a 73 percent reduction in the amount of chlorides from subwatershed 20. Sub-watershed 20 contains the ponds in the Town of Saltville. The town ponds collect drainage from the old salt well fields. Chloride concentrations in the pond were measured in the spring of 2005 between 18,500 and 32,300 mg/l. The TMDL found that reducing the loading from this pond was critical to achieve the desired chloride concentration.

3) The TMDL considers the impacts of background pollution.

The TMDL considers the impact of background pollutants by calibrating the model to

observed conditions.

4) The TMDL considers critical environmental conditions.

According to EPA's regulation 40 CFR 130.7 (c)(1), TMDLs are required to take into account critical conditions for stream flow, loading, and water quality parameters. The intent of this requirement is to ensure that the water quality of the Upper North Fork of the Holston River is protected during times when it is most vulnerable.

Critical conditions are important because they describe the factors that combine to cause a violation of water quality standards and will help in identifying the actions that may have to be undertaken to meet water quality standards[4]. Critical conditions are a combination of environmental factors (e.g., flow, temperature, etc.), which have an acceptably low frequency of occurrence. In specifying critical conditions in the waterbody, an attempt is made to use a reasonable "worst-case" scenario condition. For example, stream analysis often uses a low-flow (7Q10) design condition because the ability of the waterbody to assimilate pollutants without exhibiting adverse impacts is at a minimum.

The HSPF model was run over a multi-year period to insure that it accounted for a wide range of climatic conditions. The allocations developed in the TMDL will therefore insure that the criteria are attained over a wide range of environmental conditions including wet and dry weather conditions.

5) The TMDL considers seasonal environmental variations.

Seasonal variations involve changes in stream flow and loadings as a result of hydrologic and climatological patterns. In the continental United States, seasonally high flows normally occur in early spring from snow melt and spring rain, while seasonally low flows typically occur during the warmer summer and early fall drought periods. Consistent with the discussion regarding critical conditions, the HSPF and model TMDL analysis effectively considered seasonal environmental variations through the use of observed weather data over an extended period of time.

6) The TMDL includes a margin of safety.

This requirement is intended to add a level of safety to the modeling process to account for any uncertainty. The MOS may be implicit, built into the modeling process by using

[4]EPA memorandum regarding EPA Actions to Support High Quality TMDLs from Robert H. Wayland III, Director, Office of Wetlands, Oceans, and Watersheds to the Regional Management Division Directors, August 9, 1999.

conservative modeling assumptions, or explicit, taken as a percentage of the WLA, LA, or TMDL. Virginia included an implicit MOS in the TMDL through the use of conservative modeling assumptions.

7) There is a reasonable assurance that the TMDL can be met.

EPA requires that there be a reasonable assurance that the TMDLs can be implemented. WLAs will be implemented through the NPDES permit process. According to 40 CFR 122.44(d)(1)(vii)(B), the effluent limitations for an NPDES permit must be consistent with the assumptions and requirements of any available WLA for the discharge prepared by the state and approved by EPA. Furthermore, EPA has authority to object to issuance of an NPDES permit that is inconsistent with WLAs established for that point source.

Nonpoint source controls to achieve LAs can be implemented through a number of existing programs such as Section 319 of the CWA, commonly referred to as the Nonpoint Source Program.

8) The TMDL has been subject to public participation.

During the development of the TMDL, public involvement was encouraged through the public participation process. Two public meetings were held to discuss the TMDL process, its findings and conclusions. Both meetings were held in the Friends Community Church in Saltville, Virginia. The meetings were held on July 14, 2005 and January 23, 2006. Approximately 20 people attended each meeting. Each meeting was noticed in the Virginia Register and subject to a 30-day comment period.